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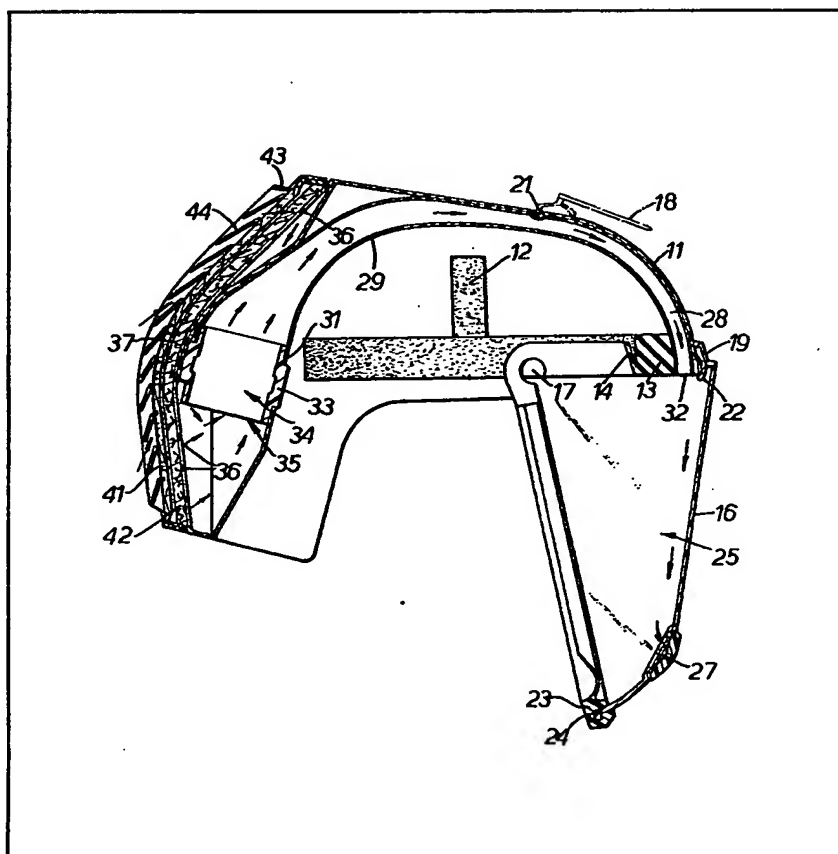
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(54) Protective respiratory helmet

(57) This invention relates to protective respiratory helmets suitable for use in a polluted atmosphere.

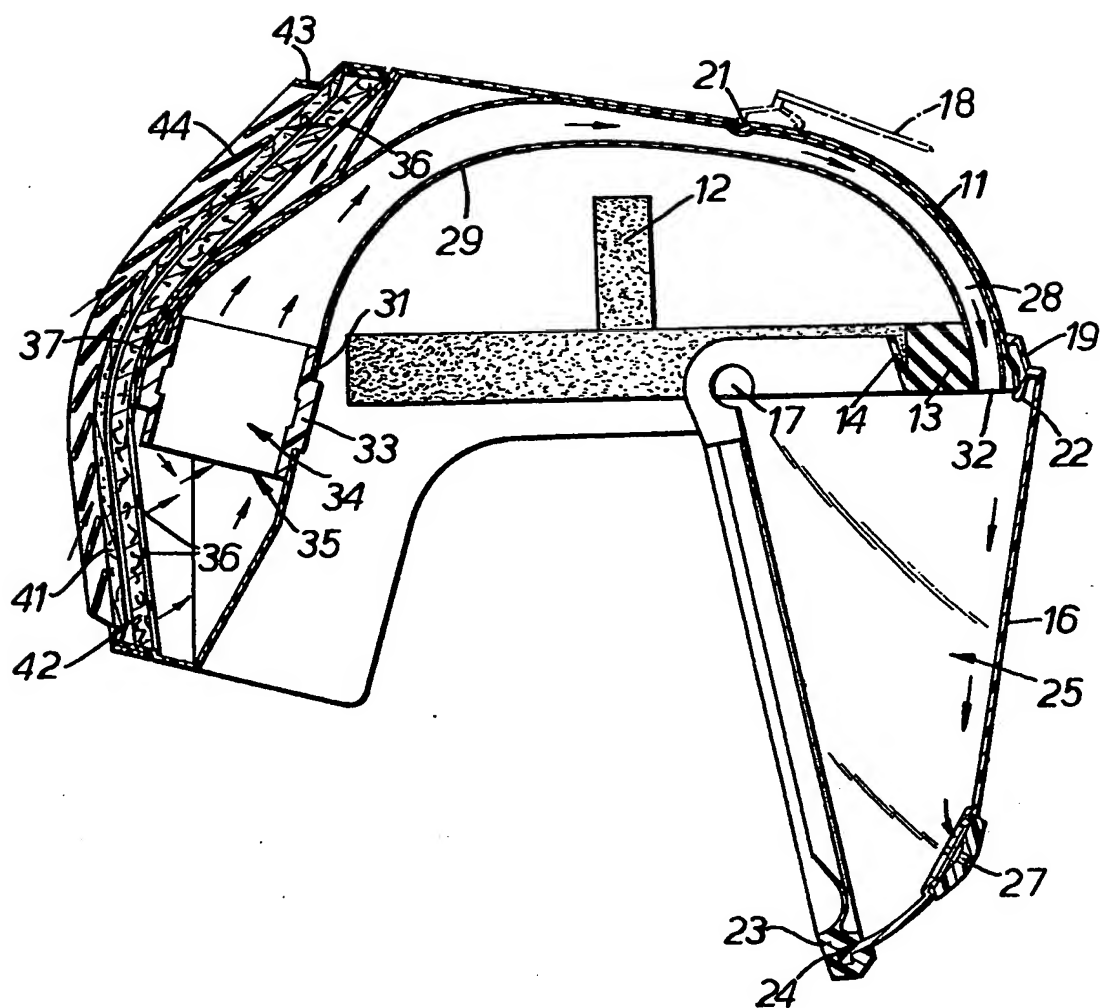
The helmet comprises a head cover 11 which is secured to the head of the wearer by an internal head band and harness 12. A visor 16 is pivotally mounted on the cover 11 by bearings 17. The visor 16 is provided with a sealing member 22 and a pair of

one-way valve flap valves 27 to allow air to leave the visor. Filtered air is supplied to the visor via a duct 28 fitted to the inside of the head cover 11. A forehead seal is provided around the inside of the front of the cover comprising a block of foamed plastic or rubber 13 with an internal flap 14. A motor and fan 34 draws ambient air into the duct 28 through filter pads 41 and 42 located in a removable plastics filter cover 43.



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## SPECIFICATION

## Protective respiratory helmet

5 The present invention relates to a protective respiratory helmet, for example a compact helmet which does not require external air lines, and is suitable for people working in a polluted atmosphere.

According to the present invention a protective  
10 respiratory helmet includes a head cover, a filter and a motor driven fan arranged to cause ambient air to flow through the filter into the space within the head cover. In a preferred form of the invention, a removable cover for the filter is adapted for attachment to  
15 the outside of the head cover over substantially the whole of the back wall of the head cover where it will be behind the head of the wearer.

The helmet may have an internal duct leading air from the fan to an opening which will be at the front  
20 of the forehead of the wearer. The duct may also be removable from the head cover. The motor driven fan is preferably mounted in the inlet end of the internal duct, to provide a complete sub-assembly.

The head cover may have a sealing element  
25 adapted to seal around the forehead of the wearer, and the duct may lead beyond the sealing element to the breathing area of the wearer.

A sealing element may be provided within the head cover arranged to form a seal around the forehead of the wearer, and a visor may be adjustably  
30 mounted on the head cover and arranged when in the lowered position to effect an automatic seal around the region of the wearer's face established partly by the sealing element in the head cover, and  
35 partly by a second sealing element carried by the visor. The visor may include a non-return exhaust valve to allow air from inside the visor to be expelled.

In most environments the visor will be made out of clear material but it may be preferred to replace this  
40 visor with a welding visor of a suitably dark material or it may be desirable to have a second welder's visor on top of the clear visor. This allows the welder working in a contaminated environment to selectively  
45 use the welder's visor while remaining protected from the ambient air.

It will be clear that the user can then only breathe air which has been filtered. Preferably there will be a flow-rate sensor arranged to give a warning if the  
50 rate of air flow is too low.

The invention may be carried into practice in various ways, and one embodiment will now be described by way of example, with reference to the accompanying drawing; of which the single figure is  
55 a side elevation partly in section of a protective respiratory helmet for persons working in a contaminated atmosphere.

The helmet comprises a head cover 11 moulded from hard plastics material, and fitted with an internal head band and harness 12, secured around the  
60 inside of the head cover to enable it to be carried comfortably on the head of the wearer. Around the

inside of the front of the cover, is a forehead seal 13 comprising a block of foamed plastic or rubber with an internal flap 14 on its cross section, which  
65 will be urged by its natural resilience against the head of the wearer when he puts the helmet on. The seal 13 terminates in a downwardly facing surface 15 at either side of the forehead.

A visor 16 moulded from a hard transparent plastics material is hinged on external bosses moulded on opposite sides of the head cover 11, and is formed with corresponding bearings at a position indicated at 17. The sides of the visor can be sprung  
75 outwardly to be fitted over the head cover bosses, and then the visor will be capable of being hinged between a lowered position shown in the figure, and a raised position indicated in dashed lines at 18 in which position it can be retained by a moulding 19 engaging in a corresponding recess 21 moulded in the external surface of the head cover 11. The upper  
80 edge of the visor is formed with a sealing member 22 for sealing the visor around the edge of the head cover 11 in the lowered position. In that position a face seal 23 clipped around an external rim 24 on the visor makes a seal around the sides of the face and under the chin of the user and also butts against the surfaces 15 so that the wearer's face is in a sealed chamber indicated generally at 25.

The seal 23 is a rubber moulding with the section indicated at 23 to have one part clipped to the rim 24 and an inwardly and rearwardly extending flap 26 which will naturally come against the face of the  
95 seal, being flexible enough to conform to irregularities in the contour of his face.

Air can be exhausted from the space 25 through a pair of one-way flap valves 27 fitted side by side in the lower half of the visor 16.

100 Filtered air is introduced into the space 25 through a duct 28 defined by a separate moulding 29 which is fitted into the inside of the head cover 11.

The moulding 29 defines the duct 28 which is of more-or-less constant cross sectional area throughout its length from behind the back of the wearer's head to the front of his forehead, although that cross section changes shape from being circular at the inlet end 31 to being curved and elongate and long and narrow to conform to the wearer's forehead at the outlet 32. The change in cross sectional shape is smooth.

At the inlet end 31, the moulding 29 is fitted around a housing 33 for a motor and fan indicated generally at 34.

115 The complete assembly of the moulding 29 with the motor and fan 34 and their housing 33, is fitted into the head cover 11 and secured in position by appropriate fastening means.

Air from outside is drawn into the duct 28 by the motor and fan 34 through the complete rear surface of the head cover 11, by way of the circular entry 35 to the housing 33.

Thus the rear surface of the cover 11 is open except for some spaced ribs 36 and a solid wall 37

where the housing 33 fits. From the upper part of that surface the air is drawn between the ribs 36 on either side of the housing 33 to be able to enter the opening 35.

5 Air entering the opening 35 is filtered by coarse and fine replaceable filter pads 41 and 42 located in a removable moulded plastics filter cover 43. The filter cover 43 is provided with a number of vertically spaced horizontally extending louvres 44 which  
10 direct the incoming air, and which serve to locate the primary filter pad 41. The secondary pad 42 is located against the ribs 36 at the rear surface of the head cover.

The filter cover is easily attached to, and removed  
15 from the head cover through a snap action or like connection, so that the filter pads when choked can be discarded and be replaced by fresh ones.

There are external leads for supplying the motor  
20 34 with power from a battery, which could conceivably be carried on the helmet, but in many applications will more conveniently be carried in a case on the wearer's belt.

The motor and fan 34 may be provided with a flow rate sensor which is conveniently as described in  
25 British Patent Specification No. 79,14894 (Case 20) and which is arranged to give an audible or visual warning to the wearer if the rate at which air is flowing through the fan drops below a rate which has been previously calculated to be necessary for the  
30 wearer's breathing requirements.

It will be appreciated that the helmet can be quickly and easily assembled from premoulded components and can be easily put on by the wearer because there are no external skirts to be fitted to  
35 prevent the entry of contaminated air, and indeed no external connections apart from the possible electrical connections to a battery for the motor.

The user's face is sealed when the visor is down within the space 25, to which air is supplied  
40 through the duct 28 and that air is of necessity filtered by the filter pads 41 and 42. Air he has breathed out can leave the space 25 through the one way flap valves 27.

The seal around the wearer's face is effected  
45 automatically when the helmet is put on and the visor lowered.

The mounting of the filter pads 41 and 42 externally of the head cover 11 at the back means that they can be easily replaced when clogged, that they  
50 can be of large cross sectional area without excessively increasing the size of the helmet, so that a large volume of air can be filtered, and they do not require any space within the head cover 11.

The front of the visor is smooth and may be  
55 covered by a replacable film of transparent material, which can protect the visor from scratching.

#### CLAIMS

1. A protective respiratory helmet including a head cover, a filter and a motor driven fan arranged  
60 to cause ambient air to flow through the filter into the space within the head cover.

2. A helmet as claimed in Claim 1 including a removable casing for the filter adapted for attachment to the head cover over substantially the whole  
65 of the back wall of the head cover where it will be

behind the head of the wearer.

3. A helmet as claimed in Claim 1 or Claim 2 including means defining an internal duct leading air from the fan to an opening which will be in front of the forehead of the wearer.

4. A helmet as claimed in Claim 3 in which the duct-defining means is removable from the head cover.

5. A helmet as claimed in Claim 3 or Claim 4 in which the motor driven fan is mounted in the inlet end of the internal duct.

6. A helmet as claimed in any of Claims 3 to 5 in which the head cover has a sealing element adapted to seal around the forehead of the wearer, and in which the duct leads beyond the sealing element to the region of the wearer's face.

7. A helmet as claimed in any preceding claim including a sealing element within the head cover arranged to form a seal around the forehead of the  
85 wearer, and a visor adjustably mounted on the head cover and arranged when in the lowered position to effect an automatic seal around the region of the wearer's face established partly by the sealing element in the head cover, and partly by a second sealing element carried by the visor.

8. A helmet as claimed in Claim 7 in which the visor includes a non-return exhaust valve for air breathed out by the wearer.

9. A helmet as claimed in any preceding claim  
95 including a clear visor.

10. A helmet as claimed in any preceding claim including a welding visor.

11. A helmet as specifically described herein with reference to the accompanying drawing.

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